

Compliance Monitoring Data Collection Specifications and Guidelines Eastern Washington

OVERVIEW AND CONTACT INFORMATION

This packet serves as instructions and quick reference for the Compliance Monitoring field data collection. If you have any questions, contact the Compliance Monitoring Program. This information was pulled from the following sources: the “Initial Compliance Monitoring Study Program: State of Washington Forest Practices Rules, Draft Proposal, May 14, 2006,” by Leslie Lingley, Forest Practices Rules and Board Manual, and current and archived Forest Practices Applications Instructions. Please read the Draft Proposal to get a detailed overview of the Program and work to be conducted on the FPA reviews.

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RESPONSIBILITIES OF FOREST PRACTICES FORESTERS AS LEADERS FOR FIELD REVIEWS

1. Review the field schedule and confirm the participation of DOE and DFW participants by email to confirm field dates.
2. Give the landowner a courtesy call with the dates that you will be reviewing his (her) application.
 - a. The Landowner may attend the assessment; however, no information can be taken into account other than what is presented on the approved FPA.
3. Make sure that consistency is maintained throughout the field season, and at each sites.
4. Use the field notes templates provided to document findings for all of the riparian assessments.
5. Assure that the FPF who approved the original application will not participate in making decisions for that site.
6. Assure that the FPF that approved the FPA provides site directions and logistical information.
7. Be sure that the prescribed field methods are being used consistently.
8. Work with other FPFs to perform the assessment surveys according to the established protocol.
9. Try to coordinate field days consecutively so that DOE and DFW can optimize their field days and hotel accommodations.
10. Assure that the necessary items are brought to the field including all pre-survey information.

RESPONSIBILITIES OF DOE AND WDFW PERSONNEL

1. Respond to scheduling requests for field days in a timely manner.
2. If you are unable to attend a scheduled field day, attempt to find a replacement from your respective agency.
3. Come prepared with at least the following field gear and supplies:
 - a. Field vest: paper, pencils, permanent pen/paint pen, and loggers tape with diameter measurement. Bring laser range finder, two way radios, etc., if you have them available to you.
 - b. Any items requested by the Lead DNR person, if you have them available to you.
 - c. DNR lead should supply and/or coordinate supply of flagging and other necessary field items.
4. Participate in field measurements following the Specifications and Guidelines and instructions from DNR Lead.
 - a. If you have concerns over how the field work is being conducted, discuss with DNR Lead and consult Specifications and Guidelines.
5. Provide constructive discussion of the questions in the field forms.
6. If there is disagreement about the rule, consult the rule book along with constructive discussion of the rule in question.
7. The DNR Lead has the final call on field procedures and answers on the field forms. It is up to the DNR Lead to be accountable for accuracy and consistency of the field work.
8. If you have any concerns that aren't being fulfilled by the DNR Lead, please contact the Program Field Coordinator or Program Manager.

NECESSARY FIELD ITEMS

1. Field notes templates
2. Pencils
3. Calculator
4. Scale ruler
5. Flagging
6. Forest Practice Application to be reviewed
7. Pertinent information included in file, but not in FPARS
8. Any approved Watershed Analysis prescriptions that apply to the FPA
9. Applicable field forms
10. Site class map for applications with bordering Type S or F Waters
11. Logger's tape, string box, and/or laser range finder and reflector if needed
12. Diameter tape or Biltmore stick
13. Clinometer
14. Camera
15. Forest Practices Rule book for truck

FIELD METHODS AND MEASUREMENT REQUIREMENTS

Measurement Protocols

1. Choosing Riparian Management Zones (RMZ's), Wetland Management Zones (WMZ's), and Equipment Limitation Zones (ELZ's) activities to be sampled.
 - a. *Each different activity type on the FPA will be reviewed.* Only one stream segment associated with each activity type will be assessed. For example, if the FPA is for no harvest in the Inner

Zone of one segment of a Type F stream and a harvest within the Ponderosa pine timber type habitat Inner Zone of another segment, then you must evaluate both stream segments.

- b. *For FPA's with Type S, F, Np or Ns segments*, choose the first cardinal or numerical designator (i.e. "A" or "1").
- c. *For segments with double sided RMZs*, survey both sides or as designated by FPA in (b) above.
- d. *For stream segments or water bodies without designators*: choose the stream or water body furthest to the North and/or East within the activity area, regardless of unit number.
 - i. Some streams may **be** the harvest unit boundary. If this occurs and it is the only stream to review (not one with a letter or number designation), survey this stream.
- e. *For surveys along Type S or F water with no Inner Zone management*: survey entire length or perimeter within the same site class as shown on the FPARS site class maps, including branches of the same stream system.
- f. *For surveys along Type Np or Ns water*: survey entire length, including branches of the same stream system.

2. USE FIELD NOTES TEMPLATES TO RECORD NECESSARY STAND INFORMATION:

- a. These are in Excel file "EWA Field Notes Templates.xls".
- b. Use these to record information for topic numbers 3-9, below.
 - i. Clarification: the field notes templates are to keep track of tree tallies, stream measurements, etc., while conducting the field work. In turn, these are used to help answer questions on the Field Forms once the field work is done.
- c. Fill in all required information.

3. Stream lengths, widths, and types

- a. Stream length (photo or map verified) within 10% is accepted as correct. If the difference is > 10%, measure in field with a string box, loggers tape, or laser range finder.
- b. Stream width is BFW or CMZ as defined in the Rules and described in Board Manual 2: Standard Methods for Identifying Bankfull Channel Features and Channel Migration Zones.
 - i. See 4(a) and (b) below for measurement increments.
 - ii. For channels that are obviously greater or less than 15 feet, bankfull width measurements are **not necessary**. For channels that are not obviously discernible, bankfull width should be measured with at least 10 evenly spaced measurements over a representative section of at least 500 feet.
 - iii. Concurrently measure the CMZ width on streams that satisfy the criteria above as you measure the RMZs.
- c. Note in field forms if BFW, CMZ, or stream type is incorrect and why.
- d. Measuring buffer widths will be completed **per the approved application** stream characteristics and types.

4. Laying out buffer widths

- a. Measured with a string box, logger's tape, or laser range finder.
- b. Measurements: measure and flag appropriate buffer widths at perpendicular/equal angles from stream.
 - i. First measurement is 0+00 at one end of stream (you choose and write in notes) segment as mapped in FPA.
 - ii. Every 50 feet for stream segments under 500 feet.
 - A. 0+25 is second measurement

- iii. Every 100 feet for stream segments over 500 feet.
 - A. 0+50 is second measurement.
 - iv. If terrain, brush, blow down, etc., doesn't accommodate above stationing, use what works for visibility and NOTE IN FIELD NOTES WHAT THESE DISTANCES ARE. IF MEASURING BFW, YOU MUST STILL FOLLOW STATIONING IN ii or iii above.
 - c. Overlapping RMZs: also see diagrams on page 17.
 - i. Continue flagging across overlapping RMZ's
 - ii. Trees in these overlapping areas count towards the leave trees for each stream in its respective RMZ.
 - d. Flagging
 - i. Choose your own color(s).
 - ii. Use different colors for different zones/width measurements.
 - iii. Write color choices in notes.
 - iv. Write station and date on flagging
5. No harvest buffers for all water types:
- a. Includes Core, no Inner Zone Harvest, no harvest Np buffers, or otherwise no harvest buffer.
 - b. Between every station, determine if there were trees harvested within the buffer.
 - i. **Between appropriate stations in field notes record:**
 - A. Numbers of trees cut.
 - B. Approximate size, when appropriate.
 - C. Distances from BFW.
 - D. A through C apply to all trees cut within no harvest buffer, including those within the 5% measurement uncertainty (see (b)(ii) below).
 - E. With regard to 'exceeds' category (also see 'Compliance Determinations on Field Form #14' heading, number 2(a) on page 8).
 - I. Record buffer widths when the buffer is 20% greater than the rule requirement.
 - II. Np stream buffers: record up to 20% more than the length that is required by rule. For example, a landowner would exceed the rule if the required length of Np no cut buffer is 500 feet and the landowner leaves additional 100 feet of buffer (20% X 500').
 - III. (I) and (II) don't apply when other rules require a greater buffer than the RMZ or WMZ rule (i.e. bounding out of unstable slopes).
 - ii. When answering the questions on the field forms:
 - A. Trees cut inconsistently within the 5% measurement uncertainty puts the activity **in compliance, so be sure to differentiate these from trees outside of the 5% measurement uncertainty.**
 - B. Trees cut consistently within the 5% measurement uncertainty puts the activity **out of compliance.**
6. Inner Zone Management: Ponderosa Pine, Mixed Conifer, and High Elevation timber habitat types.
- Calculate the acreage of the Inner Zone based on the correct width and length.
 - Verify basal area and required leave trees per acre as outlined in the questions on Riparian Field Forms 2-4 for Inner Zone management in the three different habitat types.
 - i. Check for stumps that appear larger than the thinning strategy allows (i.e. 21 of the largest trees required to be left for the ponderosa pine and mixed conifer habitat types).
 - ii. To verify basal area on stream segments shorter than 300 feet: 100% cruise shall be done.

- iii. To verify basal area on stream segments longer than 300 feet: strip plots over at least 25% of the RMZ area will be used to estimate basal area and trees per acre.

- A. See 'Strip plot example' on page 18.

- B. IMPORTANT RULES FOR STRIP PLOT SAMPLES:

- 1. Size of 25% of the RMZ being sampled may be increased, but not decreased
 - 2. The start of the stream segment is either the upstream or downstream end of the segment as designated in the FPA.
 - 3. Determine strip widths and line locations prior to entering the field/traversing the RMZ.
 - a. Provide map of numbered plot lines with field notes. This may be a simple hand drawn map in the field notes.
 - b. Write plot line number, date, and initials on flagging in the field.
 - c. If plots inadvertently overlap in the field, move the plot line $\frac{1}{2}$ the distance of the line spacing (calculation 4, page 18) from the previous plot line. Maintain line spacing (calculation 3, page 18) there after.
 - 4. Lines will be equal distances from each other (calculation 3, page 18).
 - 5. The first line will be half the distance of the plot line spacing from the edge of the unit boundary (calculation 4, page 18).
 - 6. Plot lines will be independent of the buffer measurement lines for statistical validity.
 - 7. Measurements for strip widths will be predetermined and can be split by the plot line or to one side or the other, but MUST BE CONSISTENT THROUGHOUT THE RMZ.
 - 8. Length of strip plots start at edge of bank full width, run perpendicular to the stream, and are bound by the edges of the buffer(s) that you are sampling.
 - c. Tally dbh by 2" diameter classes and hardwood vs. conifer.
 - a. See notes template for Inner Zone harvest in Excel file 'Riparian Notes Templates_E WA'.
 - f. Calculate basal area per acre.
 - i. Basal area calculations are built in to the Excel worksheets and can be used electronically or manually. Also see 'Board Manual Section 7, Appendix D, Determining Basal Area' on page 19.
 - g. Calculate trees per acre.
 - h. High elevation, only: calculate percent conifer along with f and g, above.
 - a. Refer to Board Manual Section 7, Appendix G, Western Washington Preliminary Riparian management Zone Screening Stand Tables to verify the leave tree requirements. Note: this is because WAC 222-30-022 (1)(b)(iii)(B) refers to WAC 222-30-021 (1)(b). Because it is difficult to run DFC with Eastern Washington parameters, we will use Appendix G.
 - i. If there is discrepancy of greater than 5% between what is required to be left by the rule and what is calculated using strip plots, perform 100% tree measurements and counts.

7. Outer Zone:

- a. Tally 100% the outer zone trees until the appropriate numbers and sizes of required leave trees have been counted.
 - i. See "Outer zone riparian leave tree requirements" tables on page 15.
 - ii. With regard to "exceeds" category: after counting required number of leave trees, count extra trees until you have reached twice the requirement.

8. Salvage in Riparian Management Zones:

- a. Lay out RMZs where salvage occurred per the FPA (see number 4 on page 3).

- b. Core Zone and/or CMZ:
 - i. Tally any portion of down trees salvaged that originated from the Core Zone or CMZ, even if any portion of it lies in the Inner or Outer Zones.
- c. Inner Zone:
 - i. If there is no salvage proposed, tally any down trees salvaged that originated from the Inner Zone, even if any portion of it lies in the Outer Zone or beyond.
 - ii. Basal area per acre calculations must be included with FPA for salvage of stumps, snags, and/or down wood.
 - A. Don't verify basal area per acre calculations on the ground if there is no salvage evidence of recently downed trees (i.e. blow down salvage).
 - B. Verify basal area per acre calculations if there is salvage evidence of recently downed trees (see number 6).
 - iii. Tally 100% of remaining down wood when salvage of down wood has occurred.
 - A. See notes template for salvage.
 - B. See table for down wood requirements under 'Riparian and Wetland Management Tables' on page 15.
- d. Outer Zone:
 - i. If there is salvage evidence of recently downed trees, Outer Zone leave trees must be counted.
 - A. See number 7 above.

9. Wetland Management Zones:

- a. Verify wetland type and size: see wetland definitions and WMZ table under "RULES AND RULE CLARIFICATIONS" section starting on page 10. This can be done concurrently with WMZ measurement.
- b. Measure the WMZ per the wetland **as typed in the approved FPA**.
- c. If the FPA specifies a set (not average) WMZ width with no harvesting, follow topic numbers 4 and 5, above.
- d. For harvest in the WMZ with a variable width buffer:
 - i. Follow the boundary as marked on the ground by the applicant.
 - ii. Calculate WMZ acreage:
 - A. Measure variable widths and distances of the WMZ and put in notes template.
 - I. These will be used for estimating WMZ acreage and checking for width and spacing of openings in WMZ.
 - B. OR use a GPS to traverse the WMZ and calculate acreage.
 - iii. Tally 100% of the trees in the WMZ.
 - A. See notes template for WMZ (by diameter category).
 - B. Calculate trees per acre of each rule requirement:
 - I. 4 to 12 inches dbh trees
 - II. Greater than 12 inches dbh trees
 - III. Greater than 20 inches dbh trees
 - iv. If the WMZ as laid out by the applicant does not have either 25 TPA greater than 12 inches dbh or 5 TPA greater than 20 inches dbh, you must check the maximum WMZ per the Wetland Management Zones table for trees and/or stumps that would fall into these categories.

10. Non buffered portions of Type N streams:

- a. Look for equipment entry into 30 foot equipment limitation zone (ELZ).

- b. If yes to a, above, look for 10% soil exposure and/or mitigation for soil exposure.

11. Roads

- a. Review all new construction and maintenance roads listed on the FPA.
 - i. New construction or roads with maintenance activity will be driven or walked for the entirety of the activity.
 - ii. Where roads are utilized for multiple applications such as main haul routes, review the road as is and note this in the comment section.
 - iii. Review up to a total of 2500 feet of road abandonment spurs or road segments as listed on the FPA.
 - A. If there are multiple abandonment sections to be reviewed, start with the segments furthest north and/or east on the application.

COMPLIANCE DETERMINATIONS ON FIELD FORM #14

Draft Definitions for making determinations for compliance and professional judgment levels of non compliance

1. Status of Compliance:

The categories listed below were used to describe the status of compliance. The criteria defining these categories were developed in concert with representatives of the Forest and Fish policy group. The descriptors have been modified as the program has developed this year.

- a. **Exceeds Rule:** Landowners conducted their forest practice activities above the minimum requirements of the rule. **IMPORTANT:** An activity can't exceed the rule if there is any out of compliance for any portion of rule requirement for the total RMZ being evaluated. For example, if twice as many trees are left in the Inner Zone than is required by the rule, but there weren't enough required Outer Zone leave trees, the activity is still out of compliance.
- b. Examples of exceeds include:
 - i. Type S or F: Twice as many leave trees as required by the rule in the Inner and Outer Zones of RMZs.
 - ii. Type S, F, or Np: 20% greater no harvest buffer width than what is required by rule.
 - iii. Type Np: 20% greater length of no harvest buffer on Np stream system.
 - A. This length must be a 50 foot no cut buffer to count as exceeds when it is 20% longer than what is required.
 - B. If it is an average width no harvest buffer that falls below 50 feet wide and is more than 20% longer, calculate the acreage to determine if it is 20% greater in acreage than that of what is required by the rule.
 - iv. No harvest zones are preserved in areas the applicant originally had planned to harvest.
 - v. No harvest zones that otherwise could have been harvested under the rules.
 - vi. Road improvements beyond those required by rule were employed.
 - vii. Road abandonment that included more than required such as mulching, distribution of trees and woody debris along the road prism to deter off road vehicle travel.
 - viii. Swales, erroneously defined as typed channels that were protected.
- c. **Compliant:** Meets protection identified in the FPA and rules.
- d. **Out of compliance:** Non-compliance with the Rules and/or FPA. Examples include:
 - i. Harvest in Riparian Management Zones (RMZs) beyond the pre-determined 5% measurement uncertainty protocol. See the DNRFCMP. Document.
 - ii. Leave tree requirements not met.
 - iii. Water-crossing structures inadequate for stream protection standards.
 - iv. Stream width greater than 10 feet wide, but FPA stated it was less than 10 feet wide, affecting the width of the Inner Zone.
 - v.

2. Professional Judgment utilized for Non-Compliance-Levels:

You can substitute the categories in parentheses if it helps you make a decision when trying to define this subjectivity. The examples given for each category are not all inclusive or exclusive. Use the group's best professional judgment based on the actual field measurements and conditions relative to the rule requirements. The following dictionary definitions for these categories help to characterize these determinations. Examples are provided to put some perspective to the Compliance Monitoring program.

- a. **Trivial:** *Unimportant, insignificant, trifling, commonplace.* Minor impacts of short duration over a small area. Examples include:

- i. Evidence of slight sediment delivery that does not appear to be persistent.
 - ii. A few trees cut in the Inner or Outer Zone of the RMZ of the same or lesser ecological significance as the remaining RMZ trees.
- b. ***Apparent:*** *Readily understood, evident, obvious.* Potential impacts to resources, but generally of moderate effect. Examples include:
 - i. Required leave trees for the Outer Zone trees not attained.
 - ii. Culvert sizing is questionable, but potential impact to resources is not readily apparent.
 - iii. Soil stabilization has not occurred and there may be a potential for future impacts.
- c. ***Major*** *Greater in size, amount, number or extent.* Damage to public resources is evident or the potential for damage is high. (These include situations normally referred to the Region). Examples include:
 - i. Harvest in the Core Zone. (These include situations normally referred to the Region.)
 - ii. Harvest in areas not delineated on the FPA.
 - iii. Roads built without an FPA.
 - iv. Evidence of direct sediment delivery to typed water that appears to have been persistent.

No consensus: This is used when the participants can't agree on the compliance level. If this is the case, the Forest Practices Forester makes the determination. It is important to note that these professional judgment non-compliance levels do not have statistical validity nor should they be used to excuse forest practice activities that violate the rules or the approved application.

RULES AND RULE CLARIFICATIONS

THE FOLLOWING IS FROM WAC 222-16:

"Bankfull depth" means the average vertical distance between the channel bed and the estimated water surface elevation required to completely fill the channel to a point above which water would enter the floodplain or intersect a terrace or hillslope. In cases where multiple channels exist, the bankfull depth is the average depth of all channels along the cross-section. (See board manual section 2.)

"Bankfull width" means:

- (a) For streams - the measurement of the lateral extent of the water surface elevation perpendicular to the channel at bankfull depth. In cases where multiple channels exist, bankfull width is the sum of the individual channel widths along the cross-section (see board manual section 2).
- (b) For lakes, ponds, and impoundments - line of mean high water.
- (c) For tidal water - line of mean high tide.
- (d) For periodically inundated areas of associated wetlands - line of periodic inundation, which will be found by examining the edge of inundation to ascertain where the presence and action of waters are so common and usual, and so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland.

WAC 222-30-021(1)(c)(iv): Outer Zones, Twenty riparian leave trees must be left after harvest with the exception of the following:

- (A) If a landowner agrees to implement a placement strategy, see (iii) of this subsection.
- (B) If trees are left in an associated channel migration zone, the landowner may reduce the number of trees required to be left according to the following:
 - (I) Offsets will be measured on a basal area-for-basal area basis.
 - (II) Conifer in a CMZ equal to or greater than 6" dbh will offset conifer in the outer zone at a one-to-one ratio.
 - (III) Hardwood in a CMZ equal to or greater than 10" dbh will offset hardwood in the outer zone at a one-to-one ratio.
 - (IV) Hardwood in a CMZ equal to or greater than 10" dbh will offset conifer in the outer zone at a three-to-one ratio.

WAC 222-16-035 Wetland typing system. *The department in cooperation with the departments of fish and wildlife, and ecology, and affected Indian tribes shall classify wetlands. The wetlands will be classified in order to distinguish those which require wetland management zones and those which do not. Wetlands which require wetland management zones shall be identified using the following criteria:
*(1) **"Nonforested wetlands"** means any wetland or portion thereof that has, or if the trees were mature would have, a crown closure of less than 30 percent.

- (a) **"Type A Wetland"** classification shall be applied to all nonforested wetlands which:
 - (i) Are greater than 0.5 acre in size, including any acreage of open water where the water is completely surrounded by the wetland; and
 - (ii) Are associated with at least 0.5 acre of ponded or standing open water. The open water must be present on the site for at least 7 consecutive days between April 1 and October 1 to be considered for the purposes of these rules; or
- (b) **"Type B Wetland"** classification shall be applied to all other nonforested wetlands greater than 0.25 acre.

*(2) “**Forested wetland**” means any wetland or portion thereof that has, or if the trees were mature would have, a crown closure of 30 percent or more.

*(3) “All forested and nonforested bogs” greater than 0.25 acres shall be considered Type A Wetlands.

*(4) For the purposes of determining acreage to classify or type wetlands under this section, approximate determination using aerial photographs and maps, including the national wetlands inventory, shall be sufficient. In addition, the innermost boundary of the wetland management zone on Type A or B Wetlands may be determined by either of two methods: Delineation of the wetland edge, or identifying the point where the crown cover changes from less than 30 percent to 30 percent or more.

THE FOLLOWING IS FROM BOARD MANUAL SECTION 2

1.2 Identifying Bankfull Width and Bankfull Depth

The edge of the bankfull channel typically corresponds to the start of the floodplain. A floodplain receives floodwaters in most years, but is generally vegetated by perennial plants and trees. This vegetation often reflects repeated flow-related disturbance and may not support mature trees. The following primary indicators are used to characterize the start of the floodplain:

- **Topography** - A berm or other break in slope from the channel bank to a flat valley bottom, terrace or bench;
- **Vegetation** - A change in vegetation from bare surfaces or annual water-tolerant species to perennial water-tolerant or upland species; and
- **Sediment Texture** - A change in the size distribution of surface sediments (e.g., gravel to fine sand) (Figure 1).

Field determination of the bankfull channel edge generally relies on two or more of the following:

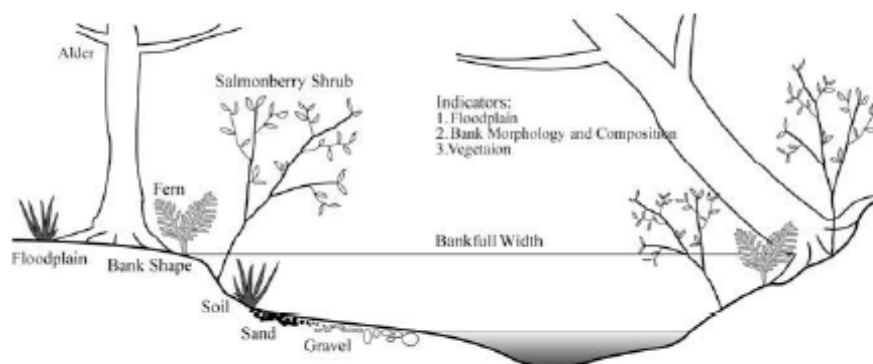


Figure 1. Indicators for determining bankfull width (adapted from Pleus and Schuett-Hames, 1998).

If physical obstructions, such as log jams, or a lack of indicators prevent accurate identification of the bankfull width at a particular point, move to the nearest place where identification is feasible. In cases where the outer edge of the bankfull width is easier to determine on one side of the channel than the other, simply identify the bankfull width on one side and project across at that same elevation to the other bank.

In streams where the substrate is dominated by boulders or bedrock or where the channel is tightly confined, a distinct floodplain may not exist. In these situations, you will have to rely on secondary indicators, such as vegetation or other evidence of flood flows to determine the bankfull width. These indicators may include:

- A change in vegetation from bare surfaces or annual water-tolerant species to perennial upland or water-tolerant shrubs and trees;
- Bare areas associated with scour around woody debris or other obstructions;
- The top of point bars; or
- The lowest elevation at which fine organic debris is caught on brush or trees.

One approach to help identify the bankfull edge is to evaluate the indicators discussed previously from within the bankfull channel looking towards the suspected bankfull edge. Identify the point

where the certainty of being within the bankfull channel is less than 100%. Then, repeat this process, but begin on the floodplain and work towards the channel. This exercise should help narrow the focus to the area between the two markings where more subtle indicators of the bankfull edge may be found (Pleus and Schuett-Hames, 1998).

1.3 Measuring Bankfull Width and Depth

Once the edges of the bankfull channel are determined, one can easily measure bankfull width and the average bankfull depth. A tape measure and measuring rod (such as a surveyor's rod) are useful to make these measurements. String wrapped around wooden stakes may also be helpful to more easily mark reference points. The most common situations where these measurements will be helpful are when one needs to:

- Determine a width category for the RMZ rules (see Board Manual Section 7); or
- Determine functional large woody debris size for CMZs in meandering rivers or as part of the LWD placement protocol. See Board Manual Section 26.

To measure bankfull width, attach or have an assistant hold one end of the tape at the bankfull edge and extend the tape to the other edge of the bankfull channel. The outlets of overflow swales, small islands, log jams, backwater eddies or regularly flooded adjacent wetlands may all occur within the bankfull width. In cases where multiple channels exist, such as around a small island, bankfull width is the sum of the individual channel widths along the cross section.

END PORTION OF BOARD MANUAL SECTION 2

HARVEST CODES FROM FPA INSTRUCTIONS

RMZ HARVEST CODES
Inner and Outer Zones A – Alternate Plan. <i>(Include Alternate Plan)</i> Inner Zone B – No Inner Zone Harvest C – Ponderosa Pine Habitat Type <i>(Provide basal area information or leave tree count by diameter class)</i> D – Mixed Conifer Habitat Type <i>(Provide basal area information or leave tree count by diameter class)</i> E – High Elevation Habitat Type <i>(Provide basal area information)</i> F – High Elevation Habitat Type – Hardwood Conversion <i>(Include Hardwood Conversion Form)</i> G – Salvage. <i>(Provide basal area information or leave tree count by diameter class)</i> H – Existing Stream-adjacent Parallel Road I – Constructing a New Stream Crossing J – Road Construction or Day-lighting K – Yarding Corridors Outer Zone L – No Outer Zone Harvest M – Ponderosa Pine Habitat Type N – Mixed Conifer Habitat Type O – High Elevation Habitat Type P – High Elevation Habitat Type - Leave trees clumped around sensitive features Q – High Elevation Habitat Type - Leave trees exchanged for CMZ basal area R – Within all habitat types - Leave trees exchanged for LWD placement strategy <i>(Include a copy of the placement plan)</i> S – Salvage <i>(A down wood count may be required)</i>

Outer Zone RMZ Harvest Codes

- L – No Outer Zone Harvest
- M – Ponderosa Pine Habitat Type: If the proposal is between 0' and 2500' elevation, use the Ponderosa Pine Habitat Type outer zone width and leave **10** dominant or co-dominant trees per acre, unless following an approved LWD placement plan as in WAC 222-30-022(1)(c)(ii).
- N – Mixed Conifer Habitat Type: If the proposal is between 2501' and 5000' elevation, use the Mixed Conifer Habitat Type outer zone width and leave **15** dominant or co-dominant trees per acre, unless following an approved LWD placement plan as in WAC 222-30-022(1)(c)(ii).
- O – High elevation Habitat Type: If the proposal is above 5000' elevation, use the High elevation Habitat Type outer zone width. WAC 222-30-022(1)(c) and WAC 222-30-021(1)(c).
- P – High Elevation Habitat Type: Leave trees clumped in or around sensitive features. Show the sensitive feature on the forest practices activity map and indicate the type of sensitive feature. See Riparian outer zone leave tree strategies in WAC 222-30-021(1)(c)(ii).
- Q – High Elevation Habitat Type: Outer zone leave trees exchanged for CMZ basal area. Include the CMZ basal area calculations and the number of leave trees that will remain in the outer zone. See Riparian outer zone leave tree strategies in WAC 222-30-021(1)(c)(iv).
- R – Within all habitat types: Leave trees exchanged for LWD placement strategy. Include a copy of the LWD placement plan and a copy of the approved HPA with the FPA/N. See WAC 222-30-022(1)(c)(ii).
- S – Salvage: In the outer zone, include a leave tree count that will remain after harvest. A down wood count is needed if removing down wood and may be required if needed to meet riparian leave tree requirements. See WAC 222-30-045. Stumps and snags are *not* downed wood.

RIPARIAN AND WETLAND MANAGEMENT TABLES

Outer Zone riparian leave tree requirements, WAC 222-30-022 (1)(c)

Timber habitat type	Required leave trees per acre without LWD replacement	Required leave trees per acre with LWD replacement
Ponderosa pine	10 dominant or co-dominant trees	5
Mixed conifer	15 dominant or co-dominant trees	8
High elevation	See WAC 222-30-021 (1)(c)	10

High elevation Outer Zone riparian leave tree requirements, WAC 222-30-021 (1)(c)

Application	Leave tree spacing	Tree species	Minimum dbh required
Outer zone	Dispersed	Conifer	12" dbh or greater
Outer zone	Clumped	Conifer	12" dbh or greater
Protection of sensitive features	Clumped	Trees representative of the overstory, including both hardwood and conifer	8" dbh or greater

Inner Zone salvage down wood requirements, WAC 222-30-045 (3)(b)

Timber Habitat Type	Minimum tons/acre	Number of pieces/acre >16" X 20'	Number of pieces/acre >6" X 20'
Ponderosa pine	12	6	4
Mixed conifer	20	8	8
High elevation	30	8	8

Wetland Management Zones

Wetland Type	Acres of Nonforested Wetland*	Maximum WMZ Width	Average WMZ Width	Minimum WMZ Width
A (including bogs)	Greater than 5	200 feet	100 feet	50 feet
A (including bogs)	0.5 to 5	100 feet	50 feet	25 feet
A (bogs only)	0.25 to 0.5	100 feet	50 feet	25 feet
B	Greater than 5	100 feet	50 feet	25 feet
B	0.5 to 5			25 feet
B	0.25 to 0.5	No WMZ required	No WMZ required	

*For bogs, both forested and nonforested acres are included.

RIPARIAN MANAGEMENT ZONE DIAGRAMS

**Type 1, 2, and 3 RMZ Requirements for
Streams with Bankfull Width of 15 Feet or Less**

	River/Stream	BFW/CMZ	Core Zone Width	Inner Zone Width	Outer Zone Width
Site I 130' wide RMZ			30'	45'	55'
Site II 110' wide RMZ			30'	45'	35'
Site III 90' wide RMZ			30'	45'	15'
Site IV 75' wide RMZ			30'	45'	
Site V 75' wide RMZ			30'	45'	

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OVERLAPPING RMZs: Trees in overlapping RMZs count towards the leave trees for each stream in its respective RMZ. i.e. Where the Outer Zone of stream 'A' overlaps the Core Zone of stream 'B', the trees in the overlapping zones count towards the Outer Zone leave tree requirements of stream 'A'. Also see 4(c) on page 3.

Diagram of Stream A RMZ

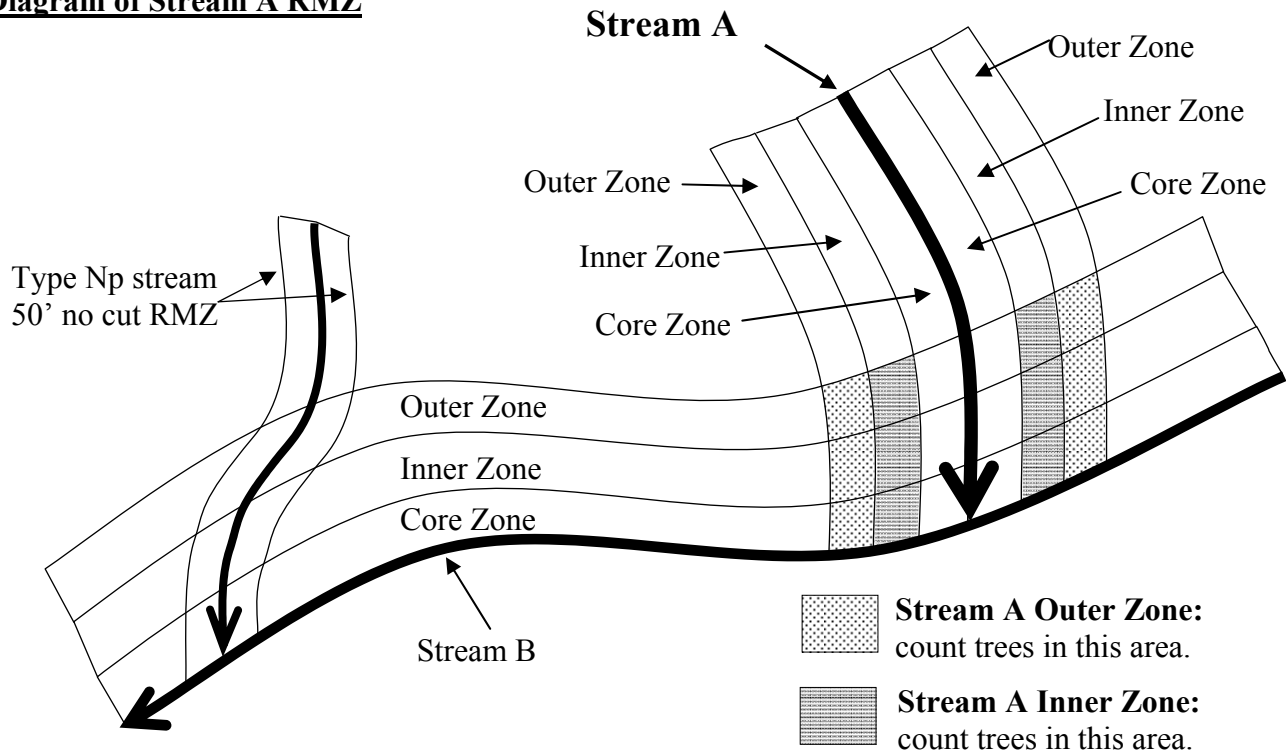
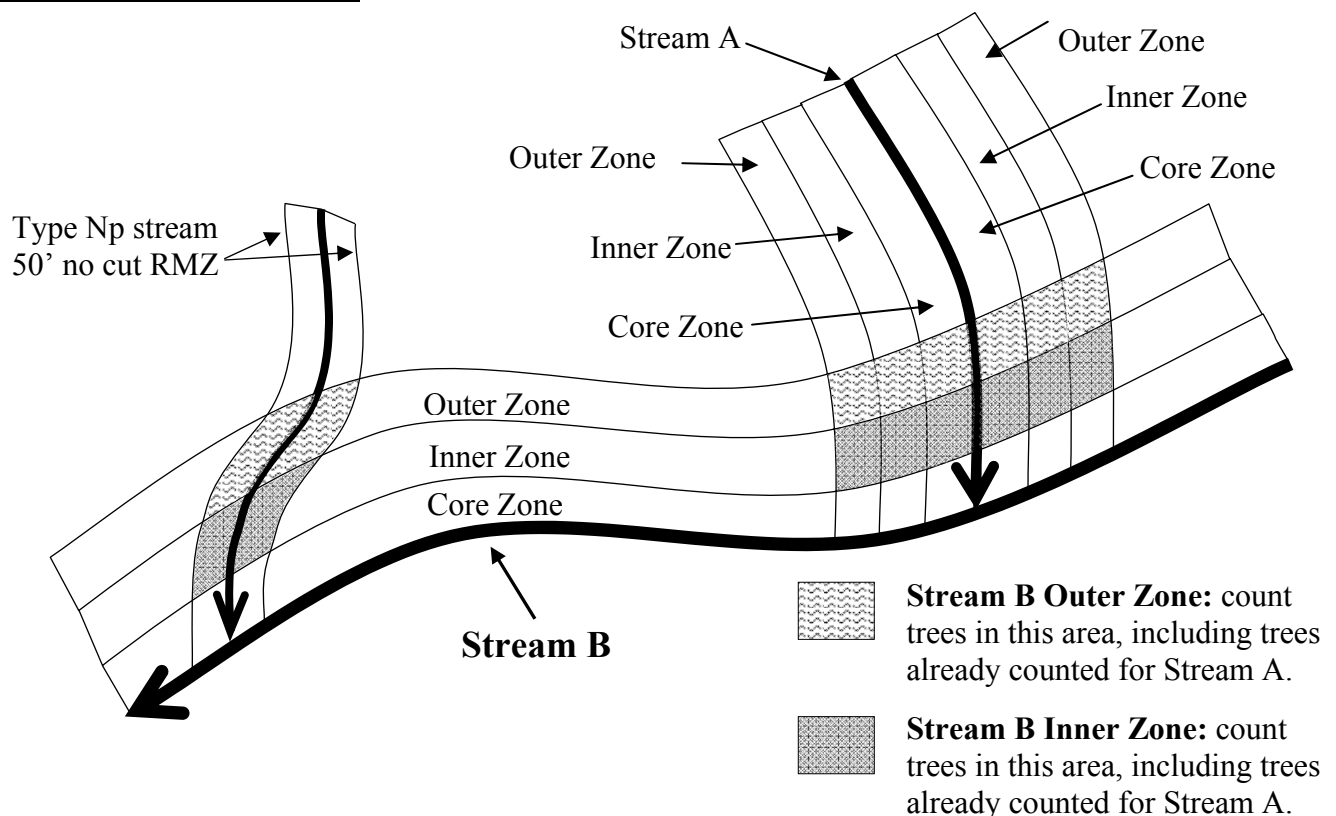


Diagram of Stream B RMZ



CALCULATIONS AND FORMULAS

Conversion from slope distance to horizontal distance

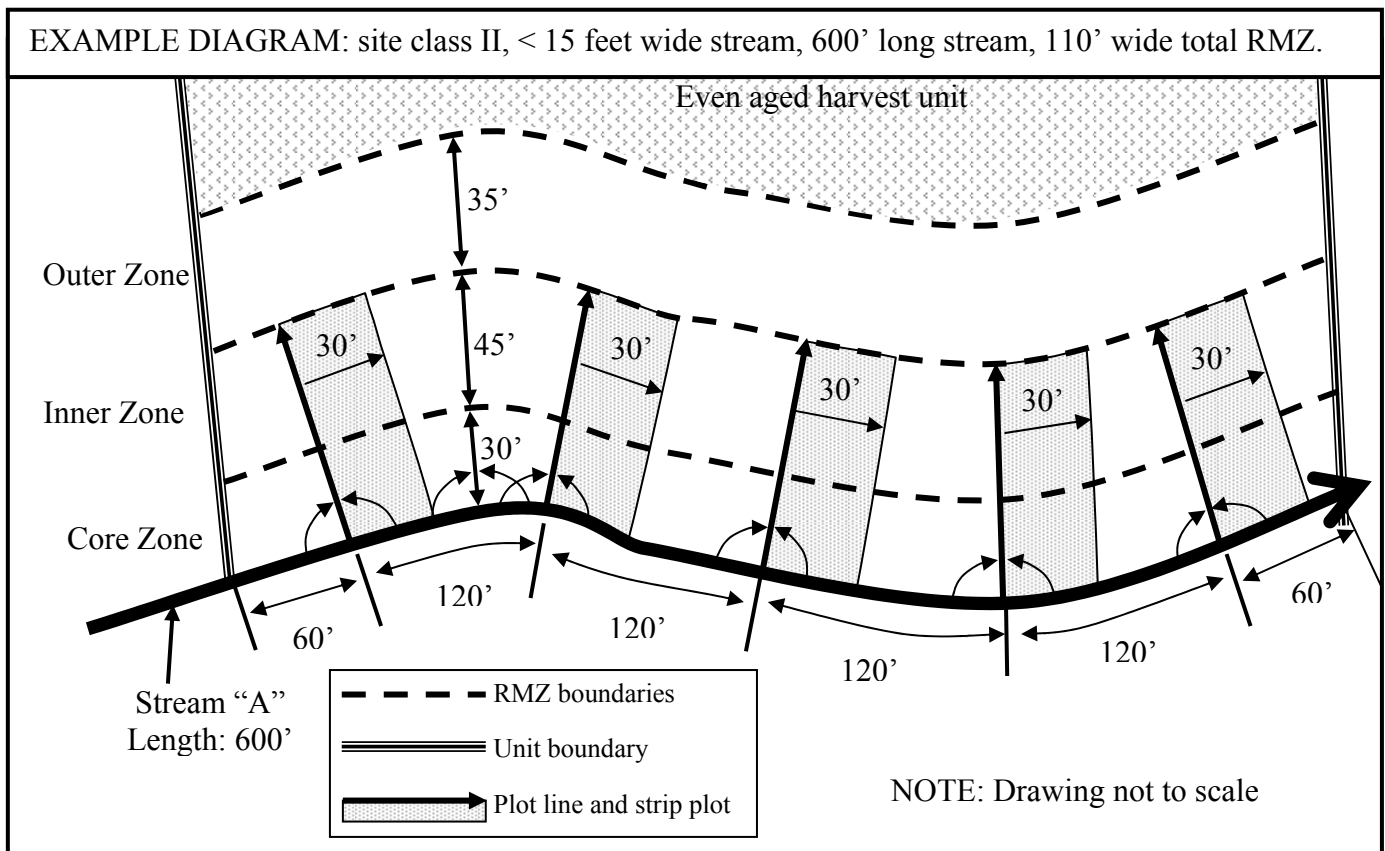
Enter slope angle in degrees, multiply by cosine, multiply by slope distance:

$$HD = (SA)(\cos)(SD)$$

Strip plot example

Follow this example to complete a strip plot cruise: Site class II, stream width less than 15 feet, total RMZ width is 110 feet (see RMZ tables).

1. Strip plots in calculations 1 and 2 (2 and 3, below) shall satisfy ALL of the following:
 - a. Strip width between 25 feet and 50 feet.
 - b. At LEAST 3 strip plots per stream segment.
 - c. For example, stream segments longer than 600 feet will have more than 3 plots in order for the strips to be less than 50 feet wide.
2. CALCULATION 1: 25% of RMZ to be sampled.
 $.25 \times (\text{Stream length}) = .25 \times 600' = 150'$
3. CALCULATION 2: deciding width of strip plots. Five strips will be done for this example.
 $(\text{CALCULATION 1}) / (\text{number of strip plots}) = 150' / 5 = 30'$ wide strip plots
4. CALCULATION 3: plot line spacing
 $(\text{Stream length}) / (\text{number of strip plots}) = 600' / 5 = 120'$ plot line spacing
5. CALCULATION 4: location of plot line #1
 $.5 (\text{CALCULATION 3}) = .5 \times 120' = 60'$ from the start of the stream segment
6. BASAL AREA CALCULATION:
 $BA/ac. = (\text{total plot BA}) / (\text{plot length} \times \text{plot width in feet}) / 43,560 \text{ sq. ft.}$
7. TREES PER ACRE CALCULATION:
 $TPA = (\text{total \# of plot trees}) / (\text{plot length} \times \text{plot width in feet}) / 43,560 \text{ sq. ft.}$



Board Manual Section 7, Appendix D, Determining Basal Area

Determining the basal area is essential to evaluating the management options available within a inner riparian management zone. Basal area means the area in square feet of the cross section of a tree bole measured at 4.5 feet above the ground on the uphill side of the tree.

1. Measure diameter at breast height (dbh) of all the trees within the core and inner zone of the riparian management Ones. Recording the number of conifer and hardwood trees by dbh in 2 inch increments (e.g. trees from 5" to 6.9" are tallied in the 6" diameter class, trees 7" to 8.9" are tallied in the 8" diameter class, etc.) Note: tree diameters are typically measured using a Biltmore stick or diameter tape.
2. Sum the number of trees by type (conifer vs. hardwood) for each dbh class.
3. Multiply the sum of trees per dbh class by the basal area for that particular diameter class. Approximate basal area can be calculated by multiplying (dbh)(dbh) x .00545. For example, if dbh = 16": $(16)(16) \times .00545 = 1.395$ sq. ft.
4. Sum all the basal areas of all the diameter classes by typed (conifer vs. hardwood) and by zone (core vs. inner zone).
5. Total basal area per acre can be determined by dividing the square foot area of the cruised site by 43,560 sq. ft. (area of an acre) to determine acreage and then dividing the total basal area by the acreage. Example: 100' width by 1200' length = 120,000 sq ft/ 43,560 ft = 2.75 acres. BA total is 350. $350 \text{ BA} / 2.75 = 127.3 \text{ BA/acre}$.